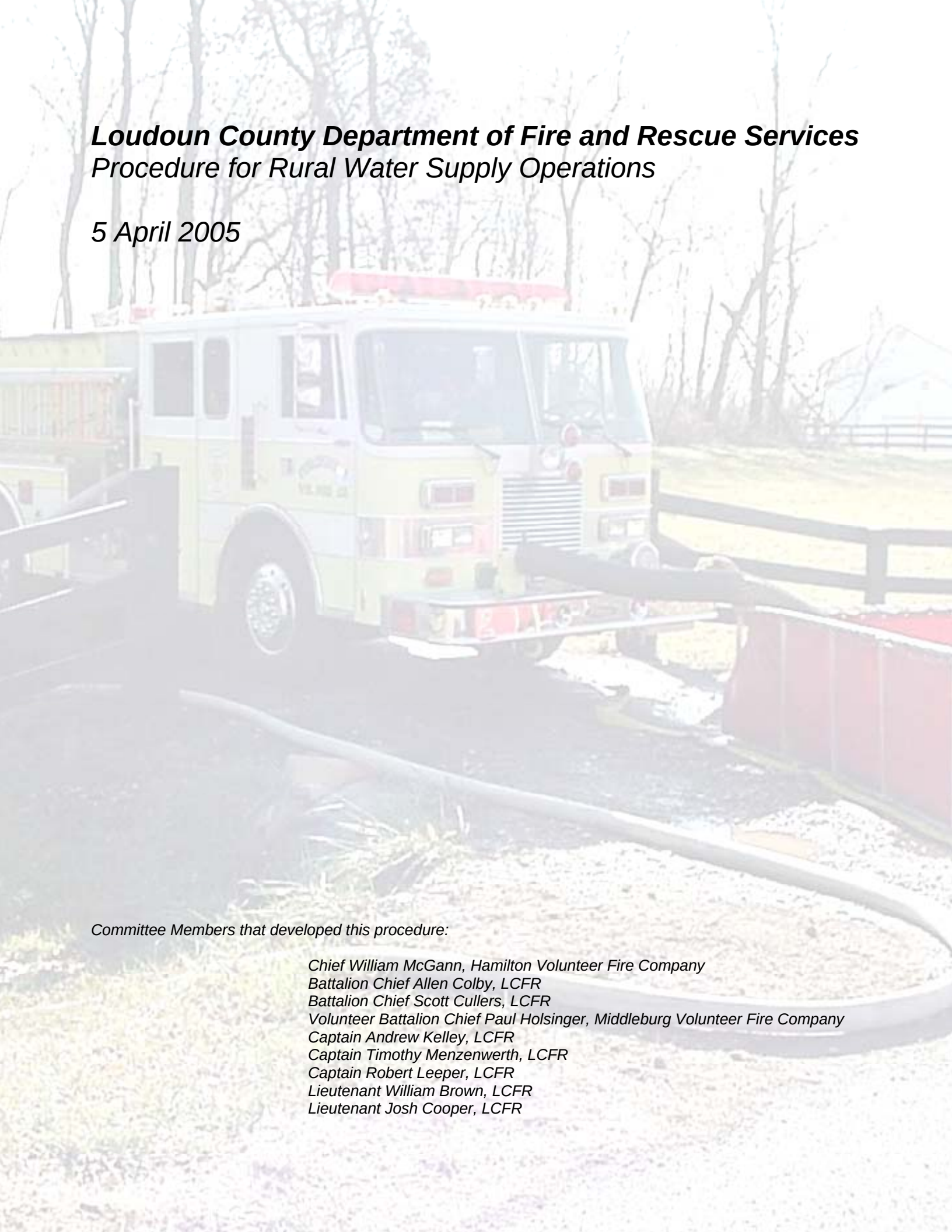

Loudoun County Department of Fire and Rescue Services

Procedure for Rural Water Supply Operations

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1. INTRODUCTION

1.1 Background

The eastern portions of the County have endured steady growth and change for the past 30-plus years. During that time the western portions of the County have remained mostly unchanged, preserving the agriculture way of life that had dominated the County since its birth. Recently, Loudoun County is quickly becoming one of the nation's fastest growing areas. The east part of the County remains the most densely populated region offering a vast variety of commercial and residential areas, while the west is thriving as a primarily residential area. Once rich farmland is now being converted into luxurious residential communities that can be found in clusters throughout the entire County. Residents are migrating to the west to get their piece of the county-life and experience the rustic charm that the west has to offer while still maintaining a short commute to work. Typical new construction in these areas produce enormous Type 5 constructed single family dwellings in the range of 2500 to 3000+ square feet as well as multi-occupancy dwellings ranging upwards to 10,000 square feet.

As growth shows no signs of stopping, the potential for significant fire loss becomes greater. Western Loudoun fire departments face several challenges that in essence have always existed but haven't been brought to the forefront until the recent growth.

1.2 The Water Supply Problem

Most western Loudoun departments are serviced by small substandard hydrant systems serving the incorporated towns. For the most part, these hydrant systems are questionable in their performance to produce large volume flows. Additionally, these hydrants systems only provide a viable water supply option in non-hydrant areas that are in close proximity to the incorporated towns.

To keep up with new home construction there has been an aggressive push for builders/developers to install storage tanks and dry hydrants to serve the newly constructed communities where a pressurized water system for firefighting purposes does not exist. The standard for storage tank installations is 10,000 gallons while dry hydrants installed on moderate sized ponds can double and in some cases even triple this capacity. Regardless of the type, storage tanks and dry hydrants installed correctly provide fire departments with a dependable supply of water that is easy to access, connect to, and maintain.

1.3 Lightweight Building Construction

New home construction is typically lightweight, wood-frame. With open floor plans and lightweight structural members, fires in these homes will spread rapidly and once structural components are exposed to fire, suppression crews have a small window of time in which to aggressively affect an interior attack with traditional suppression tactics.

1.4 Travel Times

Current fire stations are generally found in the incorporated towns and are responsible for large response areas. Regardless of staffing and equipment, travel times can quickly become the determining factor in significant fire loss. It is not uncommon for the first due engine to have 10 to 12 minute travel times, therefore subsequent responding units will have a much greater travel time.

1.5 The goal of rural water supply operations:

- **Rapid**: quickly deployed, supporting the initial attack;
- **Efficient**: providing maximum GPM/fire flow, based on available water;
- **Expandable**: enabling the water supply to increase as needed; and
- **Uninterrupted**: providing a continuous flow for the duration of the fire.

The movement of water at serious fires will almost always consist of one of three types of operations: hydrant operations, relay operations or tanker shuttle operations. In rare instances a combination of these methods may be required. Hydrant operations are usually only limited by the capacity of the hydrant system. Relay operations generally supply from 800 gpm to 1000 gpm depending upon the length of the hose lay and the size of the hose used.

Pumpers with 1250 gpm pumps equipped with large diameter hose (LDH), along with readily available tankers with folding tanks, has given the department the capability to move major volumes of water. Utilization of this equipment provides the flexibility to transport water by hose lines or tank vehicles.

1.6 Purpose

To provide a system-wide procedure for establishing an adequate and sustainable water supply on incidents where sufficient water supply for firefighting does not exist.

- To define the duties and responsibilities of each responding unit.
- To define the duties and responsibilities of the water supply supervisor.
- To establish guidelines for apparatus positioning

The operations portion of this procedure deals almost exclusively with water shuttle operations. Hydrant and relay operations are not covered in detail, as these operations are part of the NOVA Engine Company Operations book and the Driver/Operator-Pumper curriculum through the Virginia Department of Fire Programs. Keep in mind that water shuttle operations are emphasized in this procedure however, hydrant operations and relay operations are the preferred methods of obtaining water for firefighting where their use is feasible. If the distance to the water source is greater than a 3-pumper relay or 3,000 feet, a tanker shuttle is likely a better choice.

2. PLANNING AND PREPARATION

Pre-incident planning from a water supply perspective is the most important activity that a fire department can perform. Loudoun County has an abundance of natural static water supply sources. The key to utilizing these sources effectively is thorough evaluation and pre-incident planning. Before a fire occurs, the fire department must know what fire flow will be required for each and every structure or potential incident that can occur in their response area. Each company should develop a water supply plan for their response area. This water supply plan should be distributed to surrounding stations. Water supply planning should include but not be limited to:

- Identifying target hazards
- Determining needed fire flow
- Locating water sources
- Evaluating water sources
- Determining water supply methods
- Determining equipment needs
- Training

3. **DEFINITIONS**

Dump Site: The location for shuttle apparatus to dump water.

Fill Site: The location for shuttle apparatus to fill with water.

Large Diameter Hose (LDH): Supply hose of 3 ½ inches in diameter or greater.

Nursing Operation: Water supply method by which a tanker is positioned in close proximity to the attack pumper and supplies tank water to the attack pumper.

Portable Tank: Collapsible storage tank used during a relay or shuttle operation that holds water from water tanks or hydrants. This water can be used to supply attack apparatus.

Relay Operations: The procedure of utilizing three or less pumpers to supply the attack pumper with hose lines from a water source that is 3,000 feet or less from the incident scene.

Rural Water Supply: The procedure of supplying water for firefighting purposes in areas where adequate and reliable water supply systems do not exist.

Tanker: Fire apparatus with a minimum tank capacity of 1,250 gallons capable of transporting water from a water source to the fire scene.

Shuttle Apparatus: Any apparatus used for the actual movement of water in a water shuttle operation.

Shuttle Operations: Process of utilizing shuttle apparatus to move water from the fill site to the dumpsite.

Shuttle Route: The safest and most efficient route for shuttle apparatus to utilize for transporting water.

Water Supply Supervisor: The individual responsible for the development of an adequate water supply delivery system and the management of all resources assigned to the water supply operation.

Water Supply Task Force: A combination of one engine and three tankers dispatched for the purpose of performing water supply functions.

4. OPERATIONS

4.1 Multi-Engine Response

The engine's assignment depends upon where it is in the dispatch order for the alarm. In other words, the assigned function of the engine is based upon it being first due, second due, etc. This assignment is paramount in determining the preparations to be made by the engine's crew while in route to the incident. In most instances, the assignment of the engine will fall in the dispatch order. If a unit is out of position or other circumstances indicate it will arrive on the scene significantly before or after the estimated time, the unit shall communicate via radio with the responding command officer, who will then advise any change in assignments.

The standard dispatch for a structure fire (dwelling) in a non-hydrant area:

5 – Engines
3 – Tankers
1 – Truck
1 – Rescue Squad or second Truck
1 – EMS Unit
1 – Command Officer

4.2 First Due Engine

- The officer shall assess primary water supply needs and identify the source.

- While enroute, the officer shall determine the initial fill site location and have the ECC make a general announcement to all responding units.

- Layout supply line (4-inch LDH or dual 3-inch lines) from a point that is suitable for the water supply method that will be used.

- Current conditions should be assessed and reported to other units on the alarm. Give a preliminary "on-scene" radio report consisting of type of structure and evident conditions and a command statement.

- Determine an initial strategy, mode of operation, and what if any additional resources are needed.

- Determine the tactics necessary to carry out the strategy after viewing as many sides of the structure as possible.

- As a crew, take the actions necessary to implement the tactics. Communicate these actions in your “situation report” so all responding units are aware of your location and intentions.

4.3 Second Due Engine

- Closely monitor all radio traffic, particularly that of the first arriving unit(s).

- Position in an area that will facilitate the use of portable tanks and will allow for easy access and egress of shuttle apparatus. Priority should be given to leave access to the driveway for other incoming units (i.e. first arriving tanker, first arriving truck). This may necessitate:

    - Making a split lay.
    - Positioning across from the incident driveway.
    - Set up in an adjacent driveway.
    - Placing the pumper off the road.
    - Placing the portable tank in the roadway.

- Provide water supply to other units. The driver/operator will connect supply line and supply tank water to the attack pumper when ordered then prepare for drafting operations and initiate steps to ready the unit for portable tank operations.

- Be prepared to assume command where appropriate.

- Prepare to stretch a back-up line or to assist the first engine with their hose deployment.

- Once shuttle operations have begun the driver/operator should replenish tank water and maintain a reserve in the event of a shuttle failure.

4.4 Third Due Engine

Officer:

- Assume responsibility of the water supply supervisor at the dumpsite.

Pump Operator and Crew:

- Supply water into the system.

- Reposition pumper in a location that will not hinder water supply operations.

- Visual inspection of side C.
- Check for fire extension.
- Deployment of exposure line.
- Monitor all radio traffic.
- Continuously monitor and assess needs.
- Keep the incident commander apprised of situation in the rear of the structure.

4.5 **Fourth Due Engine**

- Supply water into the system if needed.
- Position pumper in a location that will not hinder water supply operations.
- Report to command for any assignments.
- Assume role of R.I.T.

4.6 **Fifth Due Engine**

- Proceed directly to and establish the fill site.
- Coordinate operations with the water supply supervisor or incident commander.
- Advise the water supply supervisor of any issues that may affect the rapid delivery of water to the incident.

4.7 **First Due Tanker**

- Drop a portable tank and other equipment needed to complete drafting operations at the dumpsite location.
- The tanker will position next to the attack pumper and become an extension of the attack pumper's booster tank utilizing a separate supply line.
- Once a sustained water supply has been established refill the tanker.

- Officer and crew will report to the command post and the driver/operator will stay with the tanker.

4.8 **Second Due Tanker**

- Report to the dumpsite and off-load water.
- Drop off portable tank and appropriate equipment and locate the fill site.
- Report to the fill site and shuttle water.
- Officer and crew will report to the command post.

4.9 **Third Due Tanker**

- Report to the dumpsite and off-load water
- Drop off portable tank and appropriate equipment and locate the fill site
- Report to the fill site and shuttle water
- Officer and crew will report to the command post

4.10 **First Due Truck**

- Take position in front of structure or at the most strategic location that will allow for rapid placement of ladders (front and rear), and entry into the structure.
- Assume responsibility of force entry if needed, search, ventilation, and ladder access.

4.11 **First Due EMS Unit**

- Position in an area that will not block apparatus and will allow for unimpeded egress from the scene in the event patient transport is necessary

4.12 **First Arriving Command Officer**

- Position on Side A, leaving space for additional apparatus
- Establish/assume command and announce the location of the command post

4.13 Water Supply Supervisor

- Coordinate with the Incident Commander
- Ascertain the required fire flow
- Determine resource needs
- Control shuttle routes
- Coordinate traffic control with police
- Request an alternate radio channel for all units operating within the water supply operation
- Locate available water sources
- The water supply supervisor should be located at the dumpsite and properly identified

4.14 Water Supply Task Force

- If water supply needs of the incident have escalated beyond the capabilities of the first alarm assignment the incident commander may request a water supply task force.
- A water supply task force will consist of:
  - 3 – Tankers
  - 1 – Engine
- The tankers shall enter into the water shuttle
- The engine shall report to the water supply supervisor for assignment.

5. ESTIMATING NEEDED FIRE FLOW

The basis for all water supply functions is dependent on knowing the required and/or predicted fire flow for the incident.

To estimate needed fire flow when adequate pre-incident planning has not been accomplished the National Fire Academy's Needed Fire Flow Formula shall be used:

$$\text{Needed Fire Flow} = \frac{\text{Length x Width}}{3} \times \text{Number of Floors} \times \text{25\% for each Exposure}$$

The needed fire flow should be estimated in the initial stages of the incident so that additional resources can be requested to make a positive impact.

6. DETERMINING WATER DELIVERY RATES

Tankers operating in a shuttle operation contribute roughly 100 gpm to the incident's required fire flow regardless of their tank size. The distance from the water source should be approximately one mile from the incident.

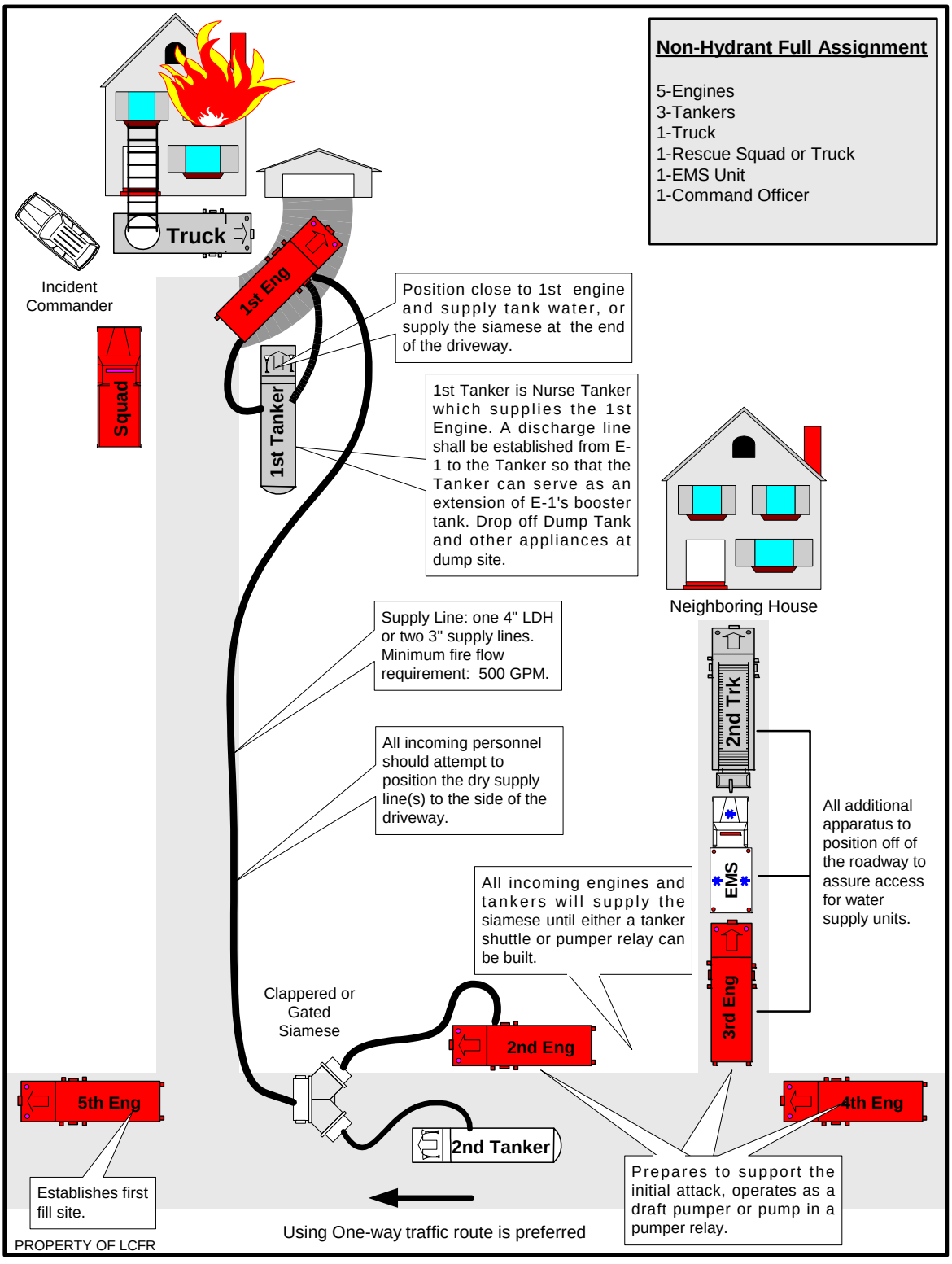
Based on this rule of thumb, the initial response to a structure fire in a non-hydrant area will supply roughly 200 gpm to the fireground through a shuttle operation. If the needed fire flow is estimated to be more than 200 gpm, a water supply task force should be requested.

To more precisely calculate water delivery rates for tankers operating in a shuttle operation use the following equation:

Tanker Capacity – 20% ÷ Total Round Trip Time in minutes = GPM

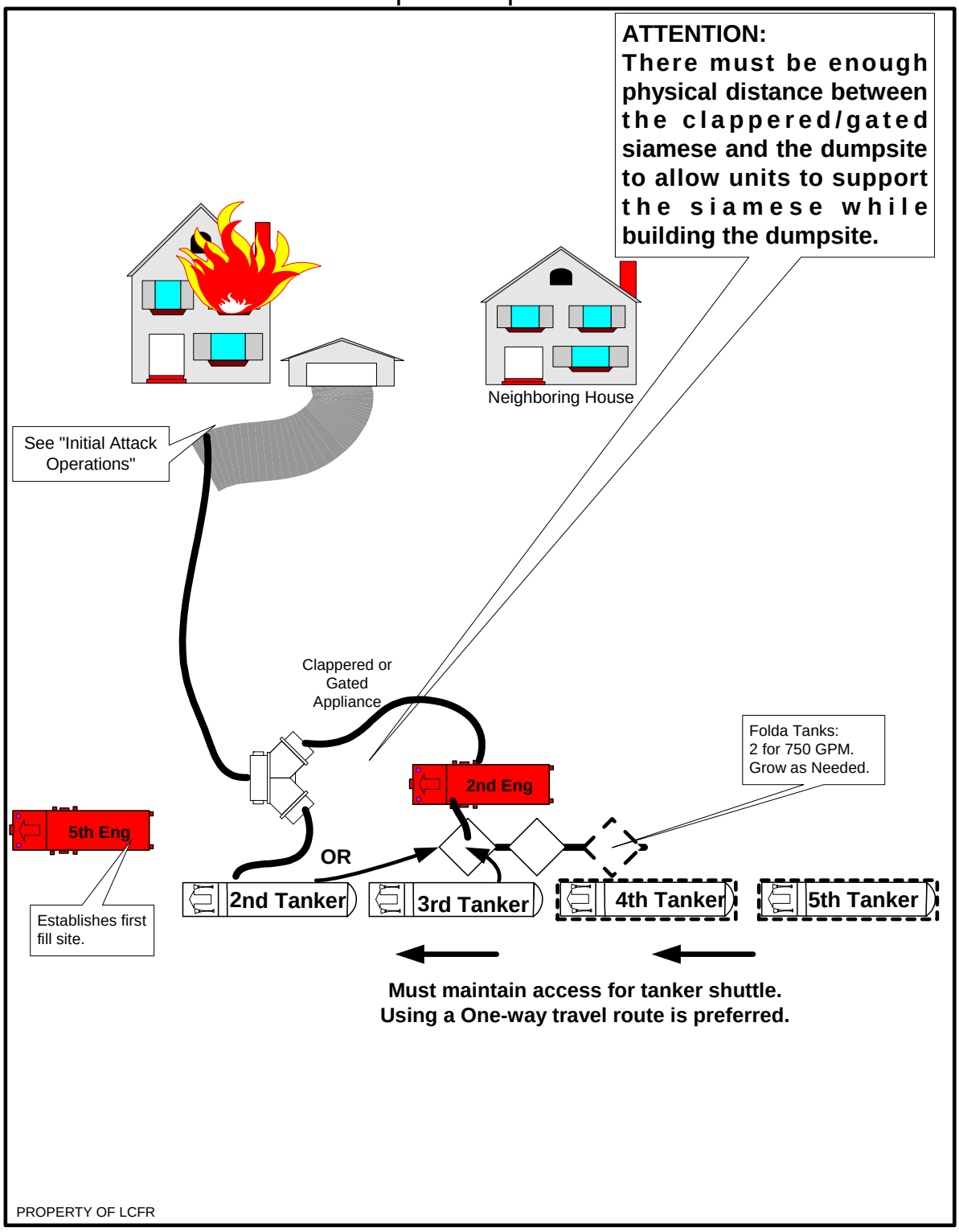
A Rural Water Supply Operations Worksheet is provided in Appendix E that will guide the Water Supply Supervisor in determining water delivery rates for each apparatus operating in a shuttle operation. This form should be carried on all apparatus.

Initial Attack Operations



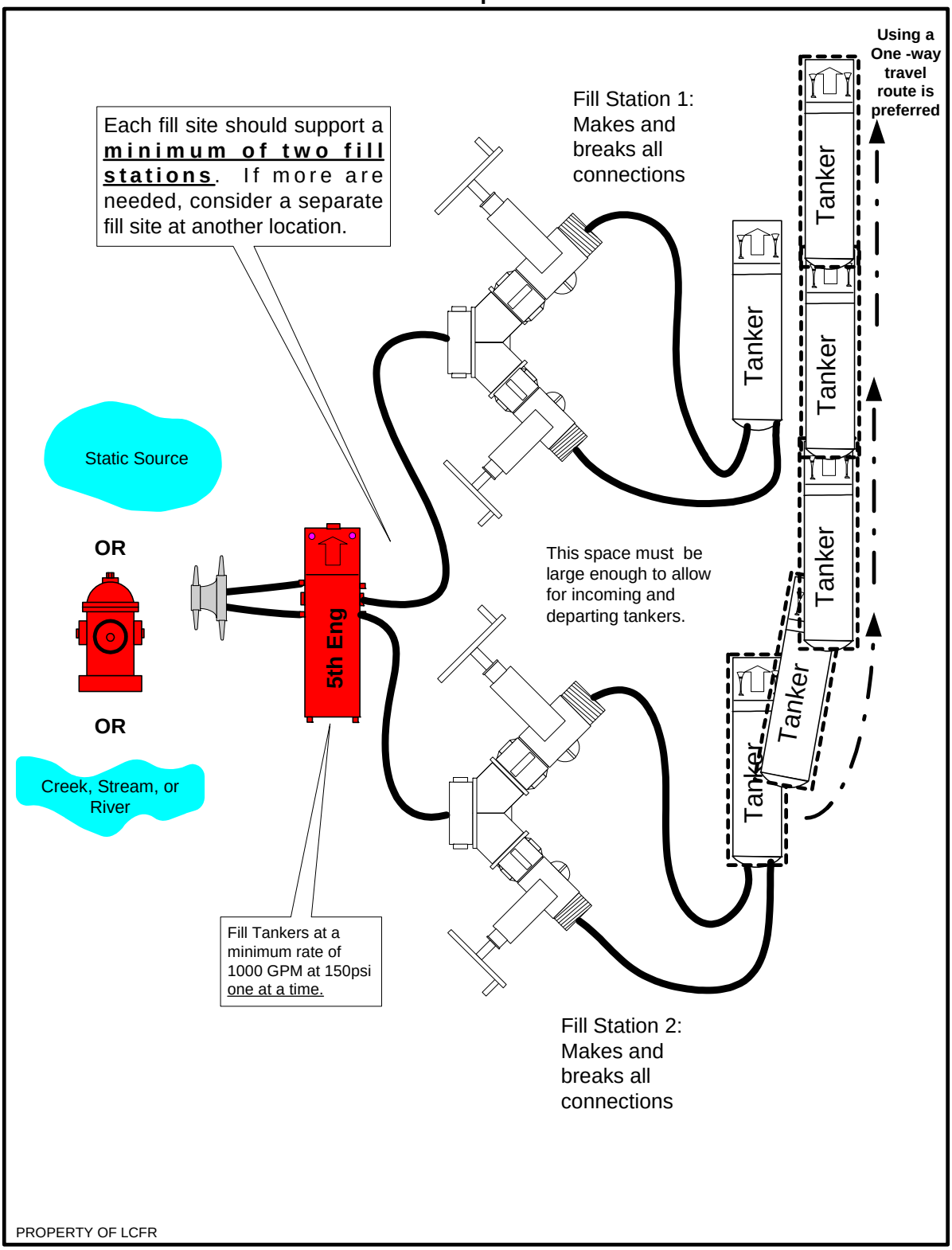
Appendix A

Dump Site Operations



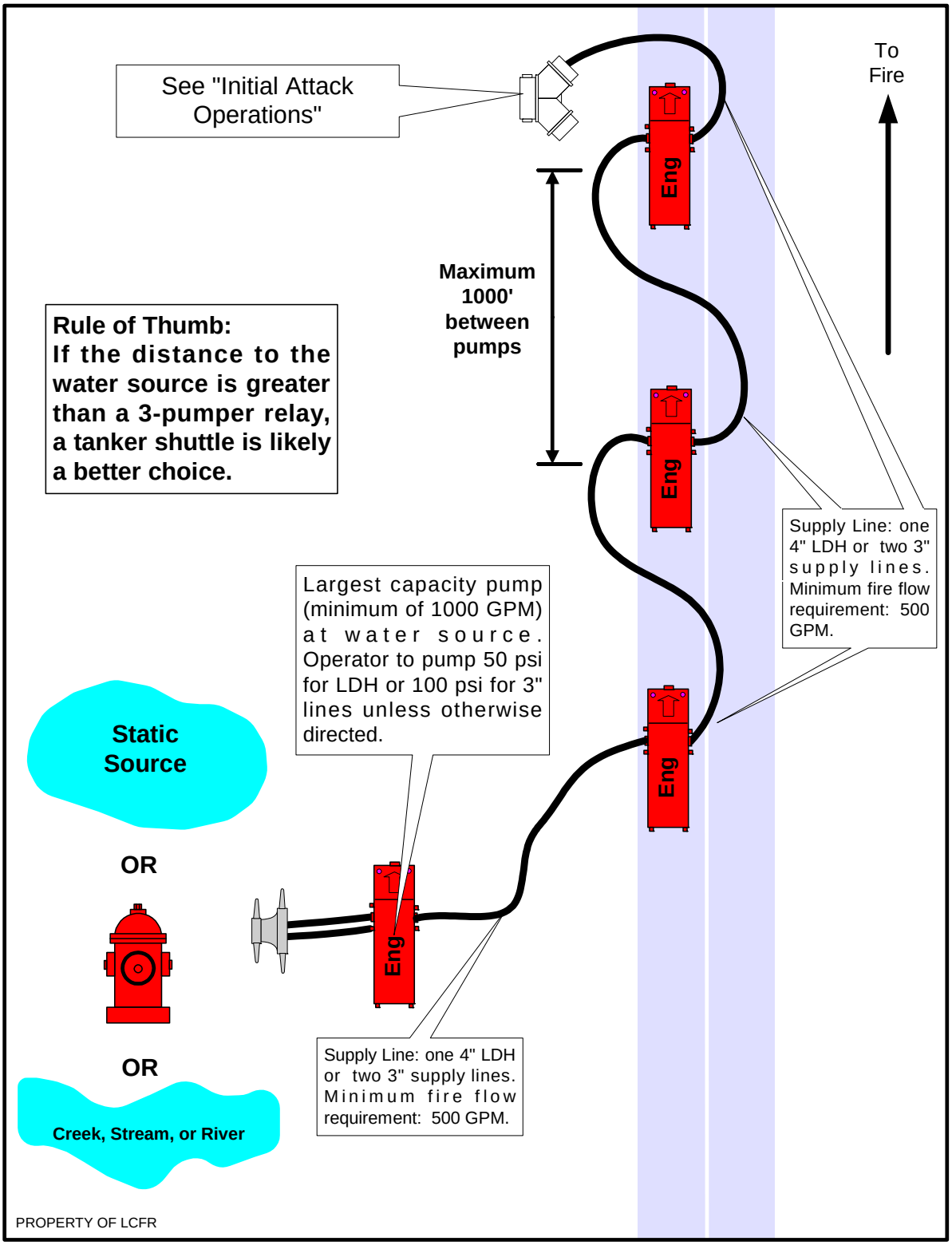
Appendix B

Fill Site Operations



Appendix C

Relay Operations



Appendix D

Loudoun County Department of Fire and Rescue Services
Rural Water Supply Operations Worksheet

Date:__________________Incident Location:________________________________

Water Supply Supervisor: ___________________ Incident Fire Flow:____________

Command Channel:_____ Operations Channel:_____ Water Supply Channel:_____

Dump Site Location:____

Primary Fill Site Location:____

Secondary Fill Site Location:____

UNIT ________ **Tank Capacity** ________	**Time Left Dump Site** (Start Time)	**Time Arrived at Dump Site & Unloaded** (Stop Time)	**Total Round Trip Time in Minutes**	**Delivery Rate in GPM**
TRIP #1				
TRIP #2				
TRIP #3				
TRIP #4				
TRIP #5				
			AVERAGE DELIVERY RATE	

UNIT ________ **Tank Capacity** ________	**Time Left Dump Site** (Start Time)	**Time Arrived at Dump Site & Unloaded** (Stop Time)	**Total Round Trip Time in Minutes**	**Delivery Rate in GPM**
TRIP #1				
TRIP #2				
TRIP #3				
TRIP #4				
TRIP #5				
			AVERAGE DELIVERY RATE	

UNIT ________ **Tank Capacity** ________	**Time Left Dump Site** (Start Time)	**Time Arrived at Dump Site & Unloaded** (Stop Time)	**Total Round Trip Time in Minutes**	**Delivery Rate in GPM**
TRIP #1				
TRIP #2				
TRIP #3				
TRIP #4				
TRIP #5				
			AVERAGE DELIVERY RATE	

Tanker Capacity – 20% ÷ Total Round Trip Time = GPM

Appendix E

Loudoun County Department of Fire and Rescue Services
Tanker Specifications

Unit ID	Tank Capacity	Pump Capacity	Portable Tank Size	Hard Suction Hose	Dump Capabilities
Tanker 1	1250	1500	1 – 1500	2 – 6”	Gravity Dump Rear Only
Engine 1	1250	1500	1 – 1500	2 – 6”	Gravity Dump Rear Only
Tanker 3	1500	750	1 – 1500	3 – 2 ½	Jet Assisted Dump Rear Only
Tanker 4	1800	1000	1 – 1800	3 – 5”	Gravity Dump Rear Only
Engine 5	1450	1000	1 – 1500	2 – 5”	Gravity Dump Rear Only
Tanker 7	1760	1500	1 – 1500	2 – 6”	Gravity Dump Rear Only
Tanker 8	1850	750	1 – 2000	2 – 2 ½” 2 – 4 ½”	Gravity Dump Rear & Both Sides
Tanker 10	3000	500	2 – 1500	2 – 4 ½”	Gravity Dump Rear & Both Sides
Tanker 12	1500	1250	1 – 1800	4 – 6”	Gravity Dump Rear Only
Tanker 16	3500	500	1 – 3000	2 – 4 ½”	Gravity Dump Rear & Both Sides
Engine 18	1250	1500	1 – 2500	2 – 6”	Gravity Dump Both Sides Only

Appendix F